A REVISION OF *TRICHANTHODIUM* Sond. & F. Muell. ex Sond. (ASTERACEAE: INULEAE: GNAPHALIINAE).

by

P. S. SHORT*

ABSTRACT

Short, P. S. A revision of *Trichanthodium* Sond. & F. Muell. *ex* Sond. (Asteraceae: Inuleae: Gnaphaliinae). *Muelleria* 7(2): 213–224 (1990). The endemic Australian genus *Trichanthodium* Sond. & F. Muell. *ex* Sond. is revised. Four species are recognized. One new species, *T. scarlettianum* P. S. Short from Western Australia, is described. Two new combinations are made: *T. baracchianum* (Ewart & J. White) P. S. Short and *T. exilis* (W. V. Fitzg.) P. S. Short. Chromosome numbers (n = 3,4,7) are reported for all species and evolution of the group is briefly discussed.

INTRODUCTION

Bentham (1867), in his treatment of the Compositae of Australia, generally adopted broad generic concepts, reducing genera recognized by botanists such as Henri Cassini, Asa Gray, Joachim Steetz and Nicholas Turczaninow to synonymy. Many such genera have been, or should be, reinstated (e.g. see Short 1983, a revision of *Angianthus* Wendl. *s. lat.*) and very often new genera should be recognized. This is also true for *Gnephosis* Cass. *s. lat.* Although not finalized my studies suggest that the *c.* 22 species will be ultimately dispersed among as many as nine different genera. *Trichanthodium* Sond. & F. Muell. *ex* Sond. is one such genus. It is readily distinguished from all other species in *Gnephosis s. lat.* by the fruit, which are covered by myxogenic cells. An absence of capitulum-subtending bracts and the capitular bract morphology are also features which provide a unique combination of characters by which the genus can be delimited from all others. The reinstatement of *Trichanthodium* is also supported by the results obtained from studies of mycorrhizal associations (Warcup 1990), and to a lesser extent by investigations of the chemical composition (Jakupovic *et al.* 1988) of species of *Gnephosis s. lat.*

At the time Bentham (1867) reduced *Trichanthodium* to synonymy under *Gnephosis* only the single species, *T. skirrophorum* was known. In subsequent years Fitzgerald (1905) described *G. exilis*, and Ewart & White (1909) described *G. baracchiana*. Neither Fitzgerald or Ewart & White commented about the delimitation of the genus although both noted an affinity with *G. skirrophora*. Since their work a further species with affinities with *T. skirrophorum* has been gathered and it (*T. scarlettianum*) is described here.

Evolution within *Trichanthodium* is particularly intriguing and partly for this reason a revision of the genus is presented here, rather than as a part of a larger paper on *Gnephosis s. lat.*

MATERIALS AND METHODS

Descriptions of taxa were made from dried collections and from specimens stored in 70% ethanol. Shapes were defined using the terms given by the Systematics Association Committee for Descriptive Terminology (1962).

Specimens were examined from the following herbaria: AD, BRI, CANB, CBG, K, MEL, NSW, NT, PERTH, UWA and KP (Kings Park, Western Australia).

The methods used to determine pollen-ovule ratios (P/Os) and anther dimensions have been previously outlined (Short 1985).

Fruit sections of *T. baracchianum* and *T. exilis* were obtained following the methods outlined in Short *et al.* (1989).

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Cytological material was obtained from either floral buds fixed in the field or from root tips obtained from freshly germinated seed. Bud material was fixed in a solution of 4 parts chloroform, 3 parts absolute ethanol and 1 part glacial acetic acid. Root tips were pretreated in a 0.002 M solution of 8-hydroxyquinoline for two hours.

TAXONOMY

Trichanthodium Sond. & F. Muell. *ex* Sond., Linnaea 25: 489 (1853). TYPE: *Trichanthodium skirrophorum* Sond. & F. Muell. *ex* Sond.

[*Gnephosis auctt non* Cass.: Benth., Fl. Austral. 3:569 (1867) *p.p.*; Benth. in Benth. & Hook.f., Genera Pl. 2:320 (1873) *p.p.*; Hoffman in Engler & Prantl, Naturl. Pflanzenfam. IV(5):194 (1890) *p.p.*; J. M. Black, Fl. S. Aust. 1st ed. 646 (1926), 2nd ed. 926 (1957) *p.p.*; J. H. Willis, Handb. Pl. Vict. 2:730 (1973); Grieve & Blackall, W. Aust. Wildfls 817 (1975) *p.p.*; Short in Jessop, Fl. Central Aust. 389 (1981) *p.p.*; Short in Jessop & Toelken, Fl. S. Aust. 1519 (1986) *p.p.*]

Annual herbs. Major axes ascending to erect; stem simple or forming major branches at basal and/or upper nodes; major axes often developing minor shoots; all axes glabrous or lanate to tomentose. *Leaves* mainly alternate but the lowermost pair opposite, all leaves sessile, entire, ± narrowly oblong to linear, ovate to lanceolate or narrowly elliptic, glabrous or lanate to tomentose, usually slightly mucronate but the uppermost ones with a hyaline apex. *Inflorescence* a compound head, depressed to broadly depressed ovoid, spheroid or obloid; general involucre usually *c.* 1/3–1/2 the length of the compound head and inconspicuous in the mature head but sometimes with leafy bracts *c.* the length of the head; the outer bracts leaf-like, the inner ones mainly hyaline and resembling the capitular bracts. *General receptacle* flat to convex, glabrous or with long bristles. *Capitula* 8– *c.* 250 per compound head. *Capitular bracts* 4–7, in 1 or 2 whorls, flat to conduplicate, primarily hyaline and yellow in the upper part but at least those of the outer row with a distinct, opaque midrib; outermost bracts densely hairy at the apex of the midrib with the bracts united by the tangled hairs; innermost bract(s) glabrous or sparsely hairy at the apex of a usually indistinct midrib. *Florets* 1 per capitulum; corolla tubular, 5-lobed, yellow. *Style* branches truncate, with short sweeping hairs. *Stamens* 5; anthers caudate, with a sterile, apical appendage; filament collar straight in outline, of uniform cells and basally not thicker than the filament. *Cypselas* homomorphic, obovoid, often somewhat flattened, brown; pericarp with myxogenic cells covering the surface, vascular bundles two; testa containing crystals; carpopodium annular. *Pappus* an entire, truncate cup or a laciniate ring or cup.

Chromosome number: n = 3,4,7.

DISTRIBUTION (Fig. 1):

The genus is confined to central and southern mainland Australia. *T. skirrophorum* occurs across much of the continent, whereas the other species have comparatively restricted distributions and occur on the western and eastern ends of the distributional range of *T. skirrophorum*. *T. baracchianum* occurs on the margins of salt lakes in western Victoria, and *T. exilis* (also commonly found on the margin of saline lakes) and *T. scarlettianum* are found in Western Australia.

ECOLOGY:

Notes on habitat are provided under each species. All usually occur in semi-arid or arid areas and habitat data suggests tolerance of fairly high levels of salinity in all species.

All four have a dual mycorrhizal system, *i.e.* they form both ectomycorrhizal and vesicular-arbuscular mycorrhizal associations (Warcup 1990).

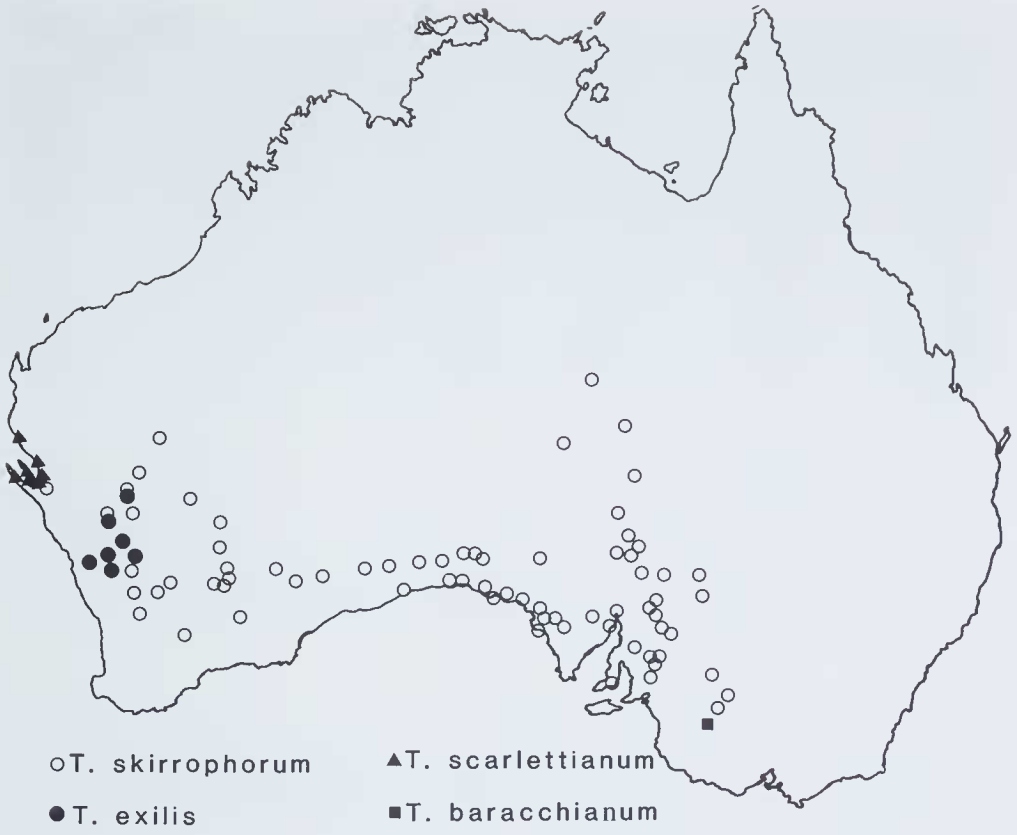

Fig. 1. Distribution of species of *Trichanthodium*.

CHEMISTRY:

Jakupovic *et al.* (1988) examined the chemistry of three species of *Gnephosis s. lat., i.e. G. arachnoidea, G. brevifolia* and *G. exilis* (= *T. exilis*). The latter showed no characteristic compounds whereas the chemistry of the two other species was found to be relatively uniform, with both producing sesquiterpene lactones. The data support the recognition of *Trichanthodium*.

BREEDING SYSTEMS:

As in previous works (*e.g.* Short 1981, 1986) pollen:ovule ratios (P/Os) have been used to help ascertain any differences in breeding system that may exist between species. The results (Table I) suggest that cross-pollination is common in all species but less common in *T. baracchianum*, this species having a much lower average P/O than the others. The reduction in pollen production is reflected in smaller anther size and the smaller, barely protruding anther appendages are also indicative of a greater degree of inbreeding in this species.

CYTOLOGY:

Chromosome number determinations for members of this genus are summarized in Table II. I do not doubt the accuracy of the determinations for *T. baracchianum* (n = 3), *T. exilis* (n = 3) and *T. skirrophorum* (n = 4) but determinations of both n = 3 and n = 7 for *T. scarlettianum* are perhaps open to question. On the other hand both Turner's voucher specimen and *Short 2097* certainly belong to this species and it may be that, as with *Pogonolepis* (Short 1986), the morphological species concept does not equate well with biological species.

Table I. Pollen:ovule ratios (P/Os), anther characteristics, and chromosome numbers in species of *Trichanthodium*. Minimum, maximum and average values are shown where applicable.

Species	P/O	Total anther length (mm)	Length of microsporangia (mm)	Length of terminal anther appendage (mm)	Chromosome number (*n*)
T. baracchianum	404–1526 (891)	0.51–0.78 (0.65)	0.35–0.57 (0.46)	0.15–0.23 (0.18)	3
T. exilis	3504–6550 (5135)	0.99–1.18 (1.06)	0.71–0.92 (0.79)	0.24–0.33 (0.27)	3
T. scarlettianum	5213–7304 (6195)	1.19–1.42 (1.34)	0.86–1.13 (1)	0.3–0.38 (0.33)	3, 7
T. skirrophorum	1171–5584 (3728)	0.92–1.07 (0.96)	0.63–0.81 (0.68)	0.24–0.32 (0.27)	4

Accesory chromosomes have been observed in root tips of *T. exilis*. In one collection (*Short 747*) of *T. skirrophorum* it was noted that at metaphase I three bivalents and two univalents, not four bivalents, were formed although subsequent division is apparently normal (Figs 2a, b).

EVOLUTION:

All species exhibit a similar habit and can be difficult to identify without recourse to a magnifying aid. *T. skirrophorum* is the most readily distinguishable, being the only species having a general receptacle enveloped with bristles. Although they occur on opposite sides of the continent *T. baracchianum* and *T. exilis* are morphologically very similar and if the provenance of a collection is unknown they can only be reliably identified by the differences that relate to the plants' breeding system, *i.e.* anther size, the degree of protrusion of the anther appendages from the corolla tube, and pollen grain number. As previously noted (Short 1981) a considerable number of outbreeding/inbreeding species pairs exist within Australian inuloid genera and there seems no doubt that a greater degree of inbreeding, as found in *T. baracchianum*, is the derived condition.

Cytological evolution in Australian inuloid genera has previously been discussed by Turner (1970) and Merxmüller *et al.* (1977). For his discussion Turner (1970) accepted both Bentham's (1867) circumscription of the subtribe Angianthinae and its constituent genera. His two counts for *Gnephosis skirrophora* ($n = 4$) and the 'closely related *G. gynotricha* ($n = 12$)' (Turner 1970, p. 387) suggested to him that the latter is a hexaploid on a base of $x = 4$. He further suggested that an apparent absence of genera with $x = 5$, 6 or 9 suggested that $x = 4$ was the ancestral base for this subtribe. Taxa with $n = 7$, 10, 11, 12 and 13 were considered to be aneuploid derivatives from polyploids. However, *Gnephosis gynotricha* must be excluded from both *Gnephosis* and *Trichanthodium*, and the subtribe Angianthinae is clearly an artificial assemblage of genera (Short 1983).

Following Merxmüller *et al.* (1977) the Angianthinae are now included in the Gnaphaliinae. These authors noted that the base number for non-Australian Gnaphaliinae was almost exclusively $x = 7$. They further speculated that within Australia the series of $n = 21$, 20, 19, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, and 3 could be interpreted as a descending series from 21, 14 and 7. Such a hypothesis seems reasonable as aneuploidy is correlated with annual habit in many plant groups and is the habit of the majority of Australian gnaphalioid species for which chromosome data are available.

A base of $x = 7$ is an *ancestral* base number for the entire Gnaphaliinae. Genera which appear to have lower base numbers than $x = 7$ could be expected to exist for long-established groups of annual species which have evolved in comparatively

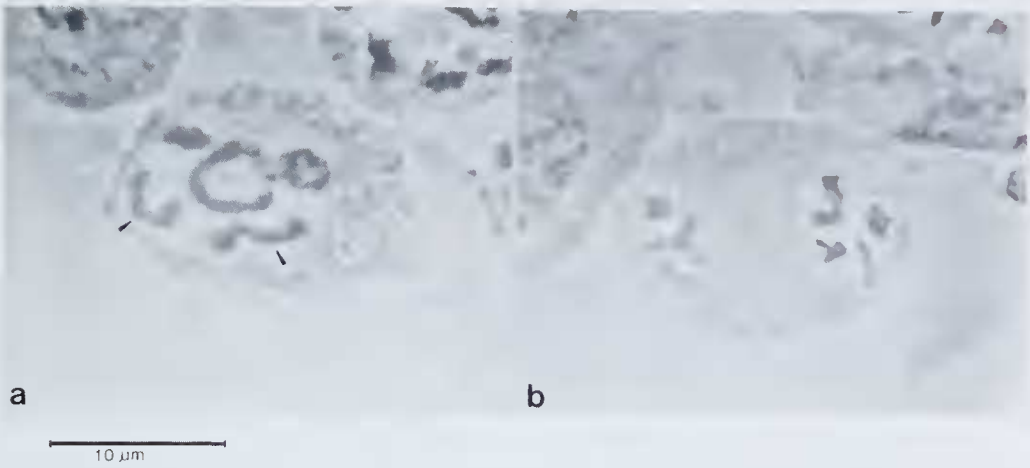

Fig. 2. Chromosomes in *T. skirrophorum (Short 747)*, $n = 4$. a—Metaphase 1 with 3 II and 2 I. b—Anaphase I.

Table II. Chromosome number determinations in *Trichanthodium*

Species & locality	n	2n
T. baracchianum		
6.5 km SSE of Gerang Gerung, Vict. 3.xi.1984, *Scarlett 84/528*		6
Antwerp, Vict. 30.ix.1986, *Forbes 3152 & Albrecht*		6
T. exilis		
Mongers Lake, W.A. 18.ix.1977 *Short 563*		6 + 2 Bs
Lake Austin, W.A. 14.ix.1986 *Short 2922*	3	
T. scarlettianum		
100 miles S of Carnarvon, W.A. (*Turner 5420* —Turner 1970, as '*Calocephalus skirrhophora*')	7	
40 km W of Overlander Roadhouse, W.A. 16.x.1983, *Short 2097*		6
T. skirrophorum		
c. 20 km SE of Ceduna, S.A. *Haegi 2688 & Short*	4	
3.3 km S of Copley, S.A. *Short 747*	4 (M1 with 311 & 21)	
1 km NE of Bulla Bulling, W.A. 18.ix.1982, *Short 1757*	4	
8 km S of Billabong Roadhouse, W.A. 11.ix.1986, *Short 2834*	4	
4 miles S of Norseman, W.A. (Turner 1970)	4	
34 miles W of Eucla, W.A. (Turner 1970)	4	

arid conditions. Such a scenario seems applicable for many Australian inuloid genera. Evidence suggests that *Pogonolepis* is a genus with a base of $x = 6$ (Short 1986) and it seems reasonable to suggest that *Trichanthodium* has a base of $x = 4$, with $n = 3$ the result of aneuploid reduction while $n = 7$ is either of hybrid origin or a reduction from $n = 8$, the tetraploid condition. Aneuploid reduction from $x = 7$ is certainly an alternative hypothesis but it is not supported by the absence of taxa with $n = 5$ or 6.

Considering the close morphological relationship of the species, the peripheral

occurrences of three of them at the eastern and western range extremes of the wide-ranging *T. skirrophorum*, the apparently derived breeding system in *T. baracchianum*, and the chromosomal data, it seems likely that *T. baracchianum, T. exilis* and perhaps *T. scarlettianum* have evolved from *T. skirrophorum*, or at least an ancestral entity with similar attributes. For students interested in plant speciation this would be an ideal group for detailed karyotype analysis and complementary electrophoretic studies of isozymes.

KEY TO THE SPECIES OF TRICHANTHODIUM

1. General receptacle with bristles ..... 1. *T. skirrophorum*
1. General receptacle glabrous 2
2. Leaves tomentose; pappus a truncate cup ..... 2. *T. scarlettianum*
2. Leaves glabrous to lanate; pappus a laciniate ring or cup 3
3. Anthers 0.9–1.2 mm long, apical appendage protruding from corolla tube (Western Australia) ..... 3. *T. exilis*
3. Anthers 0.5–0.8 mm long, apical appendage not obviously protruding from corolla tube (Victoria) ..... 4. *T. baracchianum*

1. **Trichanthodium skirrophorum** Sond. & F. Muell. *ex* Sond., Linnaea 25:489 (1853).—*Gnephosis skirrophora* (Sond. & F. Muell. *ex* Sond.) Benth., Fl. Austral. 3:570 (1867); J. M. Black, Fl. S. Aust. 1st ed. 646 (1929), 2nd ed. 926 (1957); J. H. Willis, Handb. Pl. Vict. 2:731 (1973); Grieve & Blackall, W. Aust. Wildfls 817 (1975); Short in Jessop, Fl. Central Aust. 390 (1981); Short in Jessop & Toelken, Fl. S. Aust. 3:1521 (1986). TYPE: 'Cudnaka'. LECTOTYPE (here chosen): *Mueller s.n.*, Cudnaka, N. Holl. austr., *s. dat.* (MEL 542193, ex herb. Sond.). ISOLECTOTYPE: *Mueller s.n.*, On arid hills and in the plains towards Cudnaka, -.x.1851 (MEL 542194, K). See note 1.

Angianthus codonopappus F. Muell., Fragm. 9:2 (1875).—*Gnephosis codonopappa* F. Muell., in Giles, Geog. travels in Cent. Aust., 217 (1875), *nomen nudum*; F. Muell., Fragm. 9:2 (1875), *pro syn.*; Tate, Handbk Fl. extratrop. S. Aust. 128 (1890). TYPE: 'In vicinia lacus Eyrei; Giles.' LECTOTYPE (here chosen): *Giles s.n.*, Towards Lake Eyre, 1872 (MEL 542191). See note 2.

Annual herb, major axes 3–35 cm long, densely lanate. *Leaves* lanceolate or linear, 5.5–25 (33) mm long, 0.5–1.2 mm wide, tomentose, grey-green. *Capitula* 25–200 (*c.* 250) per compound head. *Compound heads* broadly depressed ovoid to obloid, 4–12 mm long, 4.5–17 mm diam.; general involucre *c.* 1/4–1/3 the length of the head, inconspicuous in the mature heads, consisting of a few outer leaf-like bracts and numerous inner hyaline bracts which grade into the capitular bracts; general receptacle transversely ellipsoid, with long bristles. *Capitular bracts* 5–6, arranged in ± 2 whorls; bracts of the outer whorl 3–4, flat to conduplicate, narrowly elliptic or narrowly oblong, primarily hyaline but with an opaque midrib extending *c.* 2/3–3/4 the length of the bract, densely hairy at the apex of the midrib; inner 1–2 bracts conduplicate, elliptic, midrib indistinct, extending to *c.* 2/3 the length of the bract, glabrous or with a few hairs in the upper part. *Florets* 1 per capitulum; corolla tube (1.35)1.7–2.6 mm long. *Anthers* 0.92–1.07 mm long; microsporangia 0.63–0.81 mm long; terminal anther appendage 0.24–0.32 mm long. *Pollen grains c.* 1,200–5,100 per floret. *Cypselas* 1.05–1.35 mm long, 0.55–0.6 mm diam. *Pappus* cup-like, 0.6–1.2 mm long.

Chromosome number: $n = 4$.

DISTRIBUTION (Fig. 1):

Widespread in central and southern mainland Australia, south of *c.* 24° S and west of *c.* 143° E.

ECOLOGY:

T. skirrophorum grows in an array of semi-arid or arid environments, often being found in somewhat saline soils. Collector's notes include: 'in gravelly saline sand, break-away area above salt-pan', 'Gypsum. Common in low samphire shrubland', 'Clay loam in *Atriplex, Nitraria* community', 'In pale brown loam, with scattered mulga, *Heterodendrum, etc.*' and 'Sandy loam with surface gibber. Between shrubs of *Acacia* and *Atriplex*.'

NOTES:

1. The lectotype sheet of *T. skirrophorum* (MEL 542193) contains several specimens, has the original label in Mueller's hand, and description in Sonder's hand. It probably could be regarded as the holotype but it is possible that the specimen MEL 542194 was seen, though not annotated, by Sonder. The other isolectotype sheet was examined when I visited K in 1985 and a detailed comparison of this sheet and the lectotype specimen has not been made.

2. The sheet MEL 542191 contains a single specimen, plus fragments in an accompanying envelope, of *Angianthus codonopappus*. In the absence of other specimens it could be argued that the sheet could be regarded as the holotype specimen but an additional label records 'Type . . . 1 of our only 3 specimens'. Other syntype material has not been located but, as it may exist, MEL 542191 is selected as the lectotype specimen.

SELECTED SPECIMENS EXAMINED (Total *c.* 150):

Western Australia—35 km SW of Kalgoorlie, 29.ix.1965, *Donner s.n.* (AD 96713238); 128 miles N of Rawlinna, 12.x.1966, *George 8468* (PERTH); *c.* 76 km N of Bullfinch, 4.xi.1983, *Haegi 2512 & Short* (AD, MEL, PERTH); 8 km S of Billabong Roadhouse, 11.ix.1986, *Short 2834* (AD, MEL, PERTH); *c.* 3 km from Yalgoo along Paynes Find road, 14.ix.1986, *Short 2908* (MEL, PERTH).

Northern Territory—NW Simpson Desert, 29.ix.1973, *Latz 4394* (AD, NT).

South Australia—6.5 km NE of Chilpuddie, 15.x.1967, *Eichler 19549* (AD); 15 km W of Leigh Creek, 12.x.1958, *Schodde 975* (AD); 10 km W of Blanchetown, 2.xi.1971, *Whibley 3755* (AD).

Queensland—Poeppel Corner, 24.ix.1966, *Boyland 236A* (BRI, MEL, NSW).

New South Wales—48 km NE of Broken Hill, 16.x.1921, *Ising s.n.* (AD 96935543).

Victoria—24 km NW of Underbool, 20.x.1983, *Browne 176* (MEL); 45 km SSW of Mildura, 13.x.1977, *Crisp 3431* (CBG, MEL).

2. **Trichanthodium scarlettianum** P. S. Short, *sp. nov.*

Herba annua, axibus maioribus *c.* 3–25 cm longis, lanatis. *Folia* linearia vel lanceolata, *c.* 5–30 cm longa, 0.5–1.1 mm lata, tomentosa, ravida. *Glomeruli* depresse late usque depresse ovoidei, 4.5–6 mm longi, 5–11 mm diametro; bracteae glomerulos subtendentes longitudine *c.* 1/3–1/2 glomeruli; receptaculum convexum glabrum. *Capitula* 14–130. *Bracteae intra capitulum* 4–5, 2.1–3.3 mm longae, uno-vel biseritae; bracteae exteriae 4, conduplicatae, praecipue hyalinae sed costis opacis ad apicem dense pilosis; bractea interia plerumque praesens, elliptica vel oblanceolata, glabra vel costa ad apicem sparsim pilosa. *Flosculus* in quoque capitulo 1; corolla 5-lobata, tubo 1.7–2.4 mm longos. *Stamina* 5; antherae 1.19–1.42 mm longae, sporangiis 0.86–1.13 mm longis, appendicibus terminalibus 0.3–0.38 mm longis. *Cypselae* 1–1.8 mm longae, 0.6–0.9 mm diametro. *Pappus* cyathiformis, 0.5–1.15 mm longus, laceratus, albus.

HOLOTYPUS: Western Australia, Goulet Bluff, Peron Peninsula. 26° 13′S, 113° 41′E. Calcareous sand amongst samphire and *Frankenia*. 17.x.1983, *Short 2106* (MEL 1523476). ISOTYPI: AD, CANB, PERTH.

Annual herb, major axes *c.* 3–25 cm long, lanate. *Leaves* linear or lanceolate, *c.* 5–30 mm long, 0.5–1.1 mm wide, tomentose, grey-green. *Compound heads* depressed to broadly depressed ovoid, 4.5–6 mm long, 5–11 mm diam.; general involucre *c.* 1/3–1/2 the length of the head, inconspicuous in the mature heads; general receptacle convex, glabrous. *Capitula* 14–130 per compound head. *Capitular bracts* 4–5, 2.1–3.3 mm long, arranged in 1 or 2 whorls; outer bracts 4, conduplicate, mainly hyaline but with an opaque midrib extending *c.* 2/3–3/4 the length of the bract, densely hairy at the apex of the midrib; an inner bract usually present, elliptic or oblanceolate, glabrous or with a few hairs at the apex of the midrib. *Florets* 1 per capitulum; corolla tube 1.7–2.4 mm long. *Anthers* 1.19–1.42 mm long;

microsporangia 0.86–1.13 mm long; terminal anther appendages 0.3–0.38 mm long. *Pollen grains c.* 5,100–7,300 per floret. *Cypselas* 1–1.8 mm long, 0.6–0.9 mm diam. *Pappus* a white, slightly jagged cup 0.5–1.15 mm long. (Fig. 3)

Chromosome number: $n = 3, 7$.

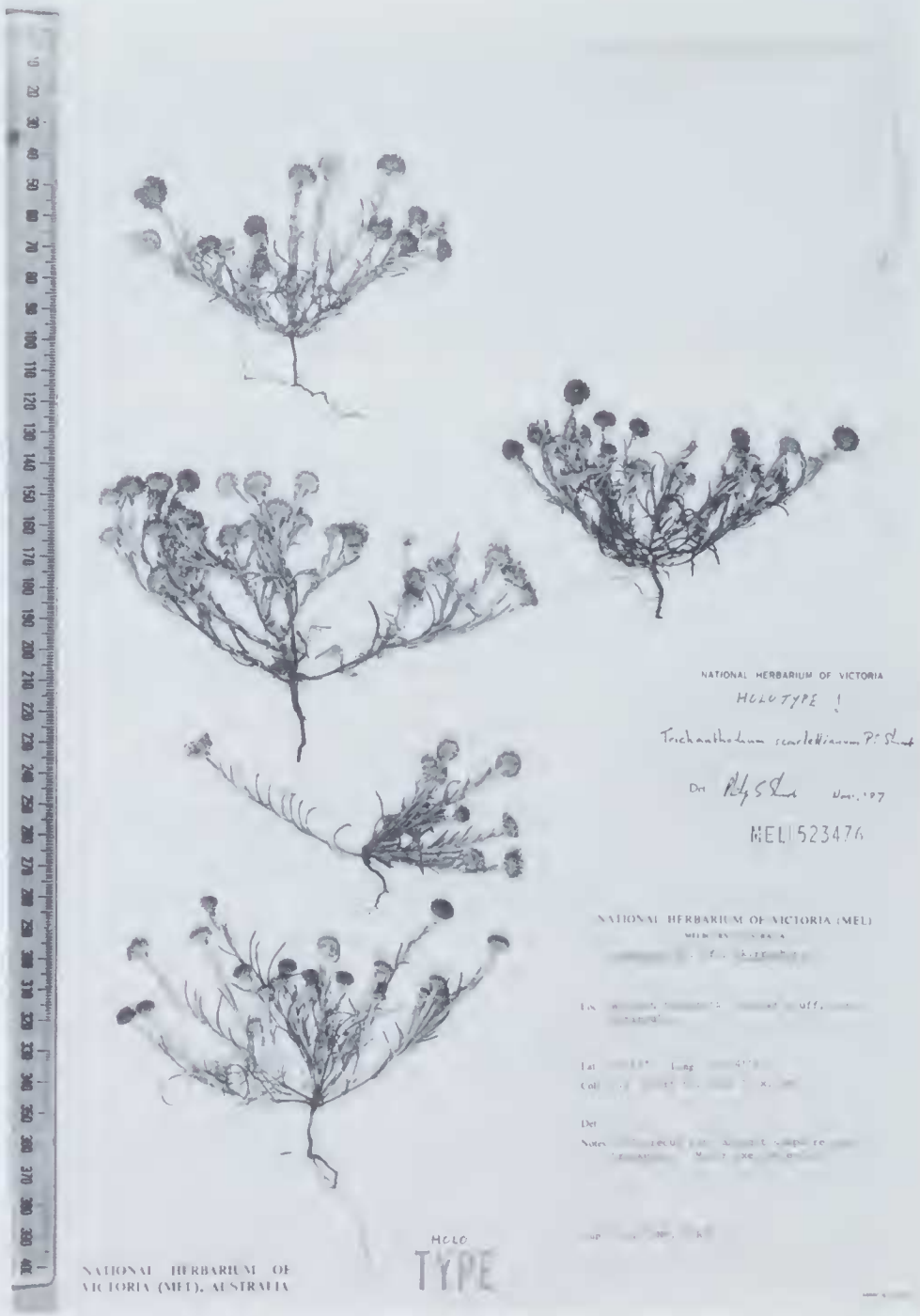

Fig. 3. Holotype sheet of *T. scarlettianum (Short 2106).*

DISTRIBUTION (Fig. 1):

Restricted to the Shark Bay region of Western Australia between latitudes *c.* 25° and 27° S and west of longitude 115° E.

ECOLOGY:

Occurs on coastal and inland arid regions, growing in sandy to clay soil and a variety of plant communities. The association of the species with samphires and *Frankenia*, as noted for the type collection, plus its occurrence on foredunes, is indicative of a tolerance to salinity. Collector's notes include: '*Acacia*, chenopod steppe. Heavy calcareous clay', 'Limestone rock interspersed with red sand. *Acacia* sp. & *Ptilotus obovatus* association', 'in loam in *Acacia* scrub', 'Low chenopod (mainly *Atriplex*) shrubland. Sandy loam' and 'Beach foredunes with *Angianthus tomentosus* & *Gnephosis tenuissima*'.

NOTES:

1. The specific epithet honours Neville Scarlett of Latrobe University. He recollected *T. baracchiana* in 1983, the first specimens to be gathered since 1910.

SELECTED SPECIMENS EXAMINED (Total *c.* 20):

Western Australia—Dirk Hartog Is., 2.ix.1972, *George 11381* (CANB, PERTH); 7 km S of Overlander Roadhouse, 20.viii.1977, *Short 420* (AD); 43 km N of Overlander Roadhouse, 21.viii.1977, *Short 443* (AD); 28 km S of Wooramel River along the North West Coastal Highway, 16.x.1983, *Short 2092* (MEL).

3. **Trichanthodium exilis** (W. V. Fitzg.) P. S. Short, *comb. nov.*

BASIONYM: *Gnephosis exilis* W. V. Fitzg., J. W. Aust. Nat. Hist. Soc. 2:24 (1905); Grieve & Blackall, W. Aust. Wildfls 817 (1975). TYPE: 'Minginew, September, 1903.—W.V.F.' LECTOTYPE: Western Australia, Minginew, -.ix.1903, *Fitzgerald s.n.* (NSW 138835).

Annual herb, the major axes 2–20 cm long, ± glabrous or lanate. *Leaves* ± narrowly oblong to linear or ± oblanceolate, *c.* 4–11 mm long, 0.7–1.3 mm wide, sometimes semisucculent, glabrous or lanate, usually green or grey-green but sometimes purple. *Compound heads* broadly depressed to depressed ovoid, spheroid or obloid, 4–11 mm long, 4.5–11 mm diam.; general involucre *c.* 1/3–1/2 the length of the compound head, inconspicuous in the mature heads; general receptacle ± flat to convex, glabrous. *Capitula c.* 10–200 per compound head. *Capitular bracts* 5–6, ± flat and narrowly elliptic or narrowly obtrullate, or conduplicate, 2.1–2.8 mm long, primarily hyaline but with an opaque midrib extending *c.* 2/3–3/4 the length of the bracts, arranged in ± 2 whorls; outer bracts densely hairy at the apex of the midrib; innermost bracts generally resembling the outer ones but less hairy. *Florets* 1 per capitulum; corolla tube 1.1–1.6 mm long. *Anthers* 0.99–1.18 mm long; microsporangia 0.71–0.92 mm long; terminal anther appendages 0.24–0.33 mm long. *Pollen grains c.* 3,500–6,550 per floret. *Cypselas* 0.9–1.6 mm long, 0.4–0.8 mm diam. *Pappus* a jagged ring, *c.* 0.2–0.65 mm long.

Chromosome number: $n = 3$.

DISTRIBUTION (Fig. 1):

Restricted to Western Australia between latitudes *c.* 27° and 30° S and longitudes *c.* 115° 30′ and 118° E. Particularly common on the Monger Lake System (in which Lake Moore is included, see Beard 1973) but extending to salt lakes on the southern margins of the Murchison Drainage Division (Bettenay & Mulcahy 1972, Mulcahy & Bettenay 1972).

ECOLOGY:

The species is commonly found on the margins of saline depressions, suggesting a high tolerance to salinity, but some collections suggest that it is not completely

confined to saline soils, with specimens occurring in red sandy soil well above the saline margins of salt lakes. Collector's notes include: 'Sandy loam on outer edge of *Halosarcia* zone in salty depression', 'Samphire flat. Gypseous clay', 'Powdery clay loam with *Halosarcia*', 'Low chenopod shrubland on saline flat', 'Clayloam. With scattered shrubs of *Lawrencia* and *Atriplex*' and '*c.* 200 m inland from salt lake. Red sandy soil'.

NOTES:

1. The only type collection known to me is NSW 138835. It is annotated 'Type' in what appears to be Fitzgerald's hand. As further syntype specimens may exist the NSW specimen has been designated the lectotype.

2. Near Yalgoo both *T. exilis* and *T. skirrophora* (*Short 2907* & *Short 2908* respectively) have been observed growing in a low lying area dominated by *Atriplex*. Both species were represented by hundreds of individual plants and it was evident that *T. exilis* tended to favour the more shallow, possibly more saline depressions. A narrow zone of overlap existed between the species but probable hybrids were not detected.

3. The pappus in *T. exilis* varies in size, from *c.* 0.2 mm to 0.7 mm long, and the extent to which it is divided into segments. The type collection displays a large, highly laciniate cup-like pappus. Other collections have a smaller pappus but, in some collections (*e.g. Wilson 12294*), some specimens have the smaller, less divided pappus ring, others have the larger, laciniate pappus. To some extent the variation is correlated with floret maturity, with the pappus becoming more laciniate as the florets mature.

SELECTED SPECIMENS EXAMINED (Total *c.* 15):

Western Australia—*c.* 7.3 km S of Bunjil, 18.ix.1977, *Short 584* (AD); *c.* 3 km from Yalgoo along road to Paynes Find, 1.ix.1982, *Short 1609* (AD, BRI, CANB, DNA, MEL, PERTH); *c.* 31 km S of Cue (Lake Austin), 14.ix.1986, *Short 2922* (AD, CANB, MEL, NSW, PERTH); 6 km S of Warriedar HS near bank of Mongers Lake, 26.ix.1986, *Wilson 12294* (MEL, PERTH).

4. **Trichanthodium baracchianum** (Ewart & J. White) P. S. Short, *comb. nov.*

BASIONYM: *Gnephosis baracchiana* Ewart & J. White, Proc. Roy. Soc. Vict. 21:542, pl. 30, figs 3–8 (1909); J. H. Willis, Handb. Pl. Vict. 2:731 (1973); Leigh *et al.*, Extinct & Endangered Pl. Aust. p. 157 (1984). TYPE: 'Salt swamp near Mission Station, Dimboola. St. Eloy D'Alton.' LECTOTYPE (here chosen): Salt swamp near Mission Station, Dimboola, *s. dat., D'Alton s.n.* (MEL 542236). PROBABLE ISOLECTOTYPE: Near Dimboola, -.i.1902, *D'Alton s.n.* (NSW *s.n.*). POSSIBLE LECTOPARATYPE: Antwerp, *s. dat., D'Alton s.n.* (MEL 1520240); Neighbourhood of Mission Station, Antwerp, *s. dat., D'Alton s.n.* (MEL 85398); Jeparit, *s. dat. D'Alton s.n.* (MEL 85397). See note 1.

Annual herb, the major axes 1–10 cm long, glabrous to lanate. *Leaves* ± narrowly oblong to linear or ± narrowly elliptic, or ovate to lanceolate, 4.5–12 mm long, 0.5–2.2 mm wide, semisucculent, slightly mucronate, mainly glabrous but sometimes sparsely lanate. *Compound heads* depressed to broadly depressed ovoid, 4–7 mm long, 5–11 mm diam.; general involucre usually *c.* 1/2 the length of the compound head and inconspicuous in the mature head but sometimes with outer leafy bracts extending *c.* the length of the head; general receptacle ± convex, glabrous. *Capitula* 8–50 per compound head. *Capitular bracts* (4–)5(–7), ± flat, narrowly elliptic of oblanceolate, or conduplicate, 2.2–2.7 mm long, primarily hyaline but with an opaque midrib extending *c.* 2/3–3/4 the length of the bract, arranged in 2 whorls; outer bracts densely hairy at the apex of the midrib; inner bracts sparsely hairy at the apex of an indistinct midrib. *Florets* 1 per capitulum; corolla tube 1.1–1.2 mm long. *Anthers* 0.51–0.78 mm long; microsporangia 0.35–0.57 mm long; terminal anther appendages 0.15–0.23 mm long. *Pollen grains c.* 400–1,500 per floret. *Cypselas* 1.3–1.5 mm long, 0.85–1.1 mm diam. *Pappus* a jagged ring 0.3–0.4 mm high.

Chromosome number: $n = 3$.

DISTRIBUTION (Fig. 1):

Restricted to western Victoria in the Jeparit–Horsham district.

ECOLOGY:

Grows in saline flats. Collector's notes include: 'flats on the fringe of a salt lake . . . disturbed ground with *Sarcocornia*' and 'in the higher parts of samphire dominated by *Halosarcia pergranulata, H. pruinosa*. Gypseous soils'.

NOTES:

1. There are four sheets of *T. baracchianum* at MEL which could be regarded as syntypes. The sheet chosen as the lectotype is the only one with a label giving the locality as Dimboola. Furthermore, it is annotated as 'Type', possibly in Ewart's hand, and contains the specimen used to illustrate the habit of the species in the original publication. The two sheets deemed to come from Antwerp also have the word 'Type' pencilled on them. This seems to be in the hand of White, suggesting that both specimens were probably viewed by Ewart & White when compiling the original description. The undated collection from Jeparit (MEL 85397) may have been viewed by Ewart and White prior to publication. However a further collection gathered by D'Alton from Jeparit on 11 October 1910 is housed at K, suggesting that the MEL collection is not a syntype.

The probable isolectotype sheet at NSW has an original MEL label and the specimens match the lectotype. Only the presence of a date and the absence of mention of the mission station for the locality suggest that it may not be a duplicate of the lectotype.

2. The species was presumably named after Pietro Baracchi of the Melbourne Observatory and a member of the Royal Society of Victoria.

3. Leigh *et al.* (1984) reported this species to be rare and possibly extinct. This is not surprising as the few specimens known to them were probably collected no later than 1910. However, in 1983, Neville Scarlett (LTB) recollected the species from several sites and it is evident that, although restricted in its distribution, it is locally common. Most importantly it is known to occur in the Mitre Flora and Fauna Reserve (*Beauglehole 86523*).

SELECTED SPECIMENS EXAMINED (Total *c.* 14):

Victoria—Mitre Flora & Fauna Reserve, 11.xi.1986, Beauglehole 86523 (MEL); 3.5 km W of Antwerp, 26.x.1983, *Scarlett 83/266* (MEL); 6 km SSW of Jeparit, 27.x.1983, *Scarlett 83/275* (MEL).

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